

**CLAIMS**

What is claimed is:

1. A system for mounting a machine tool in a tool holder for high-precision machining applications, comprising:

- a) means for shrink-fit centering of said tool in said tool holder; and
- b) means for positive restraint of said tool from rotation within said tool holder.

2. A system in accordance with Claim 1 wherein said means for shrink-fit centering comprises:

- a) a cutting tool having a cylindrical shank portion defining a continuous, uniform outer surface of substantially constant diameter; and
- b) a unitary tool holder having a conically tapered end portion and a cutting tool mounting portion, said mounting portion including a central aperture extending axially therein, the diameter of said central aperture absent said cutting tool shank portion being less than said diameter of said shank portion,

wherein said tool holder is formed of a material having thermal expansion and contraction characteristics such that the application of heat to said mounting portion thermally increases the diameter of said central aperture to allow said shank portion to be inserted into said aperture to a desired axial position,

wherein cooling of said tool holder after said tool insertion causes a rigid interface between the inner surface of said central aperture and the outer surface of said shank portion, resulting in high centration of said tool in said tool holder.

3. A system in accordance with Claim 2 wherein said central aperture has a diameter of between about 0.0001 inch and about 0.0003 inch less than said diameter of said shank portion.

4. A system in accordance with Claim 2 wherein said end portion includes a threaded aperture extending axially therethrough for receiving an extension member to facilitate the mounting of said tool holder to a rotatable spindle of a milling machine, said central aperture and said threaded aperture being coaxially aligned within said tool holder.

5. A system in accordance with Claim 2 wherein said end portion is releasably mountable to a rotating spindle of a milling machine.

6. A system in accordance with Claim 1 wherein said means for positive restraint comprises:

a) a flat formed on a shank of said tool extending into an aperture in said tool holder; and

b) a set screw disposed in a threaded bore in said tool holder for engaging said flat.

7. A system in accordance with Claim 6 wherein said flat is formed at an angle to the axis of said tool.

8. A system in accordance with Claim 7 wherein said angle is about five degrees.

9. A system in accordance with Claim 6 further comprising a second flat formed on said tool shank and a second set screw disposed in said tool holder for angularly orienting said tool during insertion of said tool into said holder.

10. A system in accordance with Claim 1 wherein said means for positive restraint includes a pin lock.

11. A system in accordance with Claim 10 wherein said pin lock comprises:

- a) a partial circumferential groove formed in said tool;
- b) a transverse bore formed in said tool holder; and
- c) a pin disposed in said bore and said groove for locking said tool to said tool holder,

wherein rotation of said tool in said tool holder is positively restrained by the circumferential extent of said groove in interference with said pin.